HF Radio at Sea

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AE6XO

The "S-O-S"

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Modes of Marine Radio Communication

- VHF marine radio
  - No license needed
  - 10-20 mile range
- Cellphone
  - 10-20 mile(?) range
- High Frequency (HF) Single Sideband (SSB) radio
  - 1.8 to 30 mHz
  - 10,000+ mile range
- Satellite
  - Available, but expensive

Uses for HF Radio

- Voice communications
  - World-wide coverage, depending on conditions
  - Emergencies
  - Marine nets
- Data communications
  - Email via the Internet
  - Access to weather information
  - Data rates are relatively slow

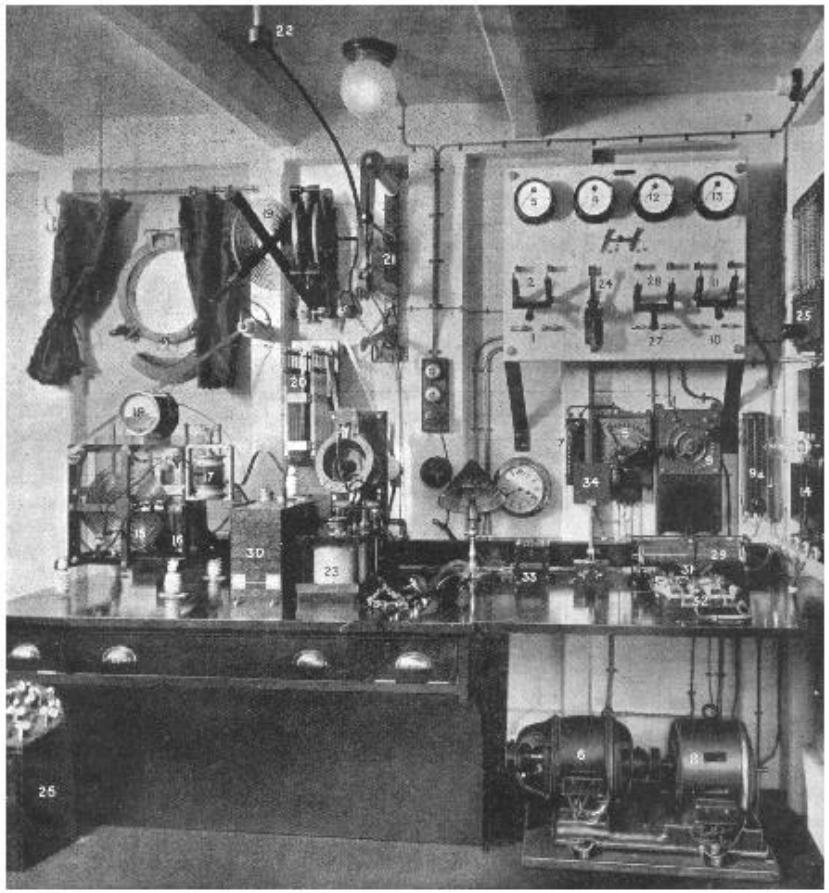


Fig. 3.– WIRELESS TELEGRAPHY CABIN ON THE S.S. "CHINDWIN."

What is Needed

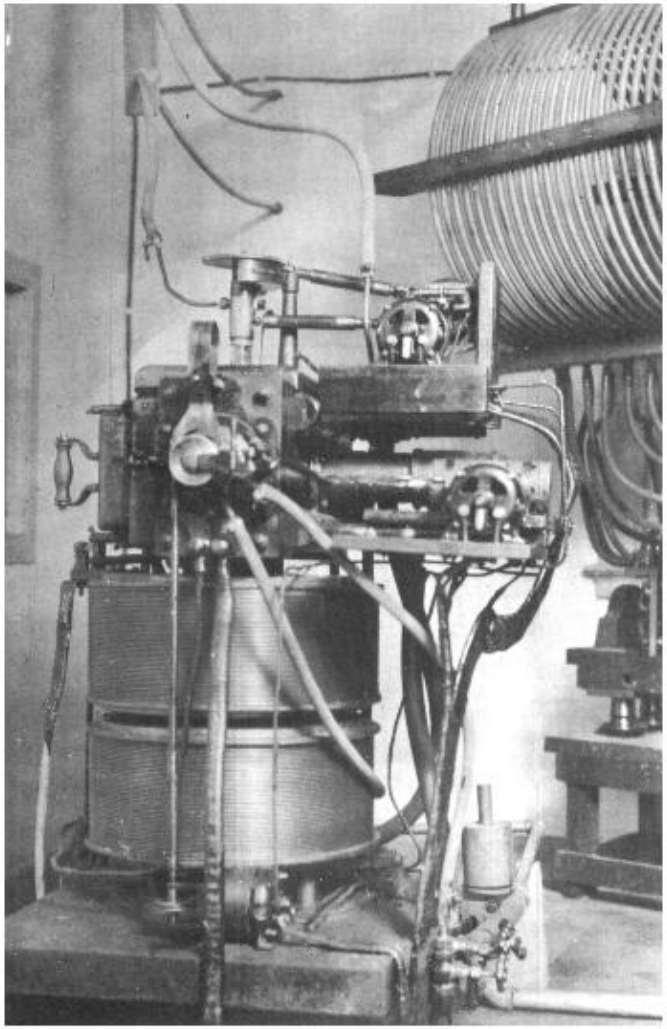
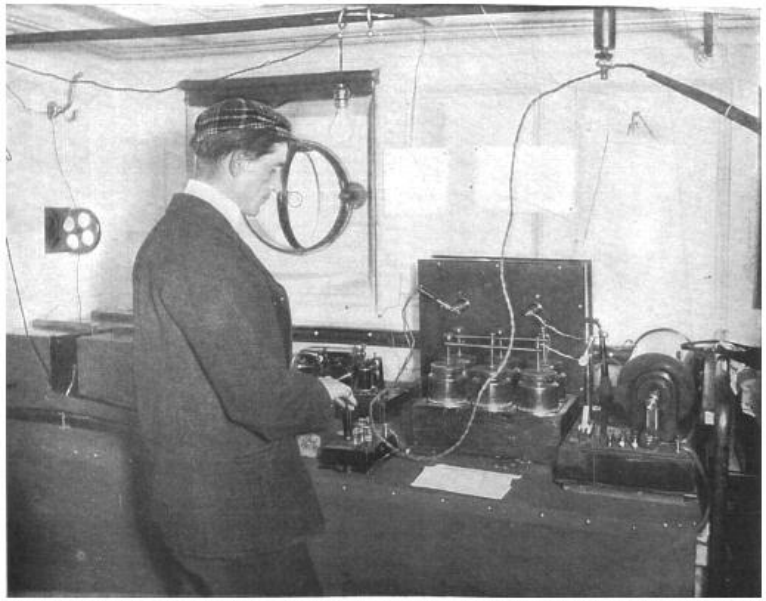
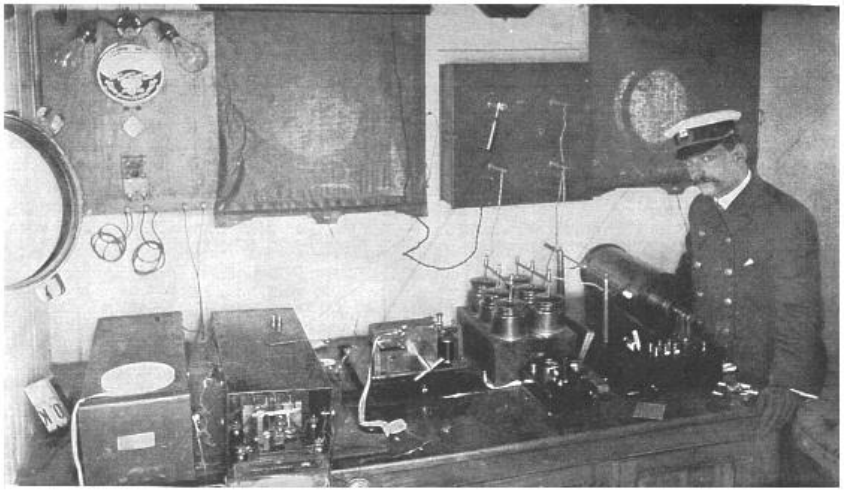


FIGURE 11-4. 30 KW Federal Telegraph arc transmitter with helix.



THE OPERATOR SENDING A WIRELESS MESSAGE. THE "CLICK" OF THE ORDINARY TELEGRAPH IS HERE A DEAFENING CRASH



THE "MARCONI MAN" AND HIS INSTRUMENTS

Ham vs. Marine Radio Licenses

- Amateur license
  - Three levels: Technician, General, and Extra
    - Each requires a technical test and NO Morse code
    - General is needed for the HF bands
- Ship Station License
  - Allows use of marine SSB bands
  - Fill out form and pay FCC
    - Ship Radio Station License ($160)
    - Restricted Radiotelephone Operator Permit ($60)
  - No test

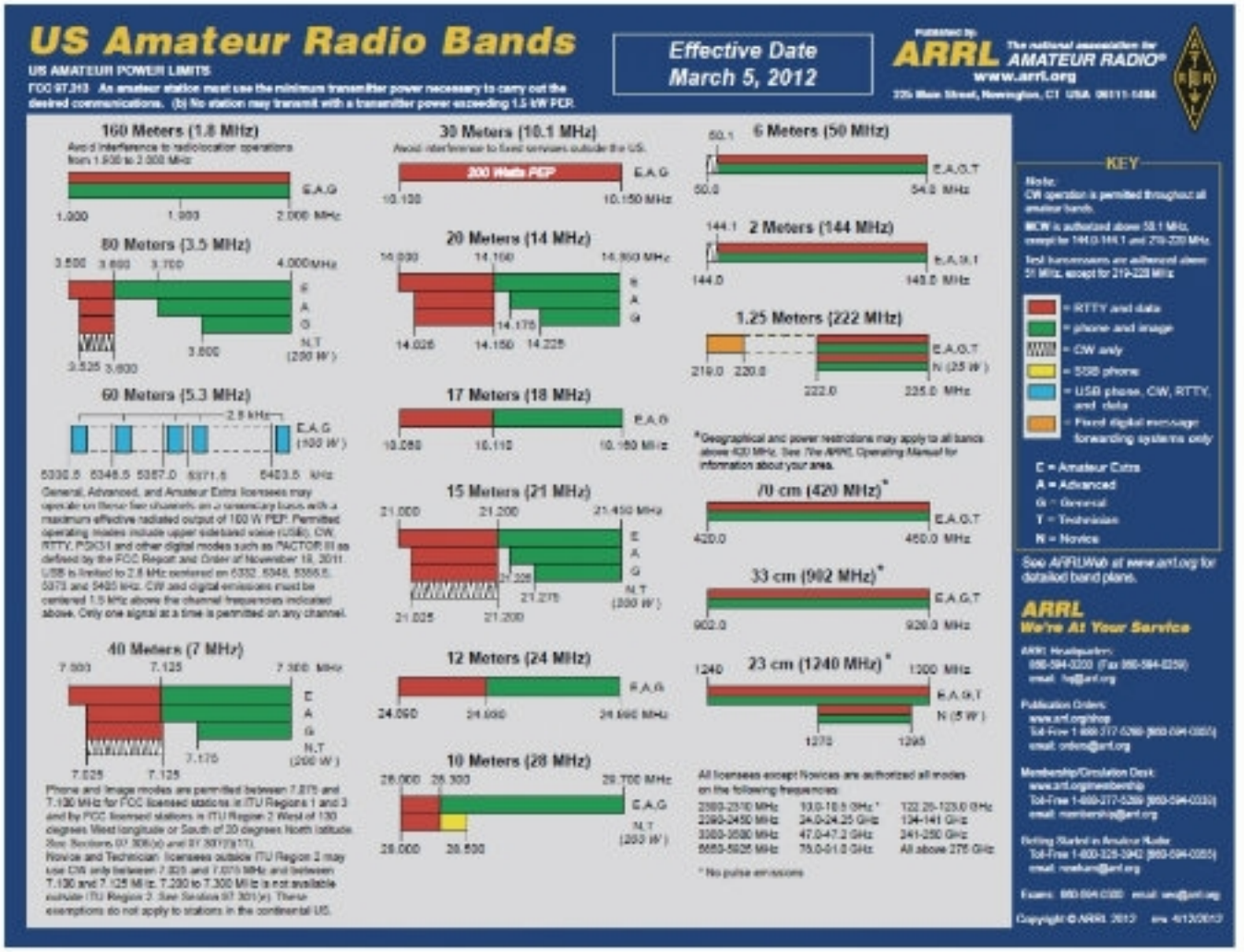
Marine SSB Frequencies

Maritime SSB Simplex Channels

Channel	4 MHz	Channel	6 MHz	Channel	8 MHz	Channel	12 MHz
4A	4146 kHz	6A	6224 kHz	8A	8294 kHz	12A	12,353 kHz
4B	4149 kHz	6B	6227 kHz	8B	8297 kHz	12B	12,356 kHz
4C	4417 kHz	6C	6230 kHz			12C	12,359 kHz
			6516 *(daytime only)*			12D	12,362 kHz
	4065,4089,4116,4408 Mississippi River		6209,6212,6510,6513 Mississippi River		8201,8213,8725,8737 Mississippi River	12E	12,365 kHz
						12,362 12,365 Mississippi River	

Channel	16 MHz	Channel	18 MHz	Channel	22 MHz	Channel	25/26 MHz
16A	16,528	18A	18,825	22A	22,159	25A	25,100
16B	16,531	18B	18,828	22B	22,162	25B	25,103
16C	16,534	18C	18,831	22C	22,165	25C	25,106
16D	16,537	18D	18,834	22D	22,168	25D	25,109
16E	16,540	18E	18,837	22E	22,171	25E	25,112
	16,543, 16,546 Mississippi River	18F	18,840	22F	22,174	25F	25,115
		18G	18,843	22G	22,177	25G	25,118

FCC Amateur Frequencies



Radio Choices

- HF SSB Transceiver
  - Can be a ham radio (variable tuning)
    - May need “mod” for other frequencies
  - Or a marine SSB (fixed tuning, simpler operation)
    - Not so easy to tune on ham and shortwave bands

Accessories

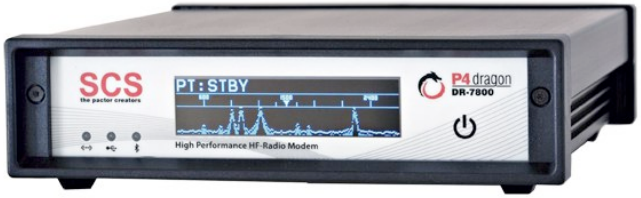
- Autotuner
  - This matches the antenna to the radio for each operating frequency
  - Eliminates need for a separate, tuned antenna for each frequency

Antennas and Grounds

- Antenna
  - The backstay of a sailboat can be used, if insulators are installed
  - May also use a long wire or dipole from the mast
  - A vertical antenna is another option
- Ground
  - Use copper foil extended through boat
  - May use through hulls or grounding plate

Modem or Sound Card

- Interface between the laptop and radio
- Connects with and sends/receives data with shore-based radio station
- Choices are Pactor or sound card (newer option)



$1,849

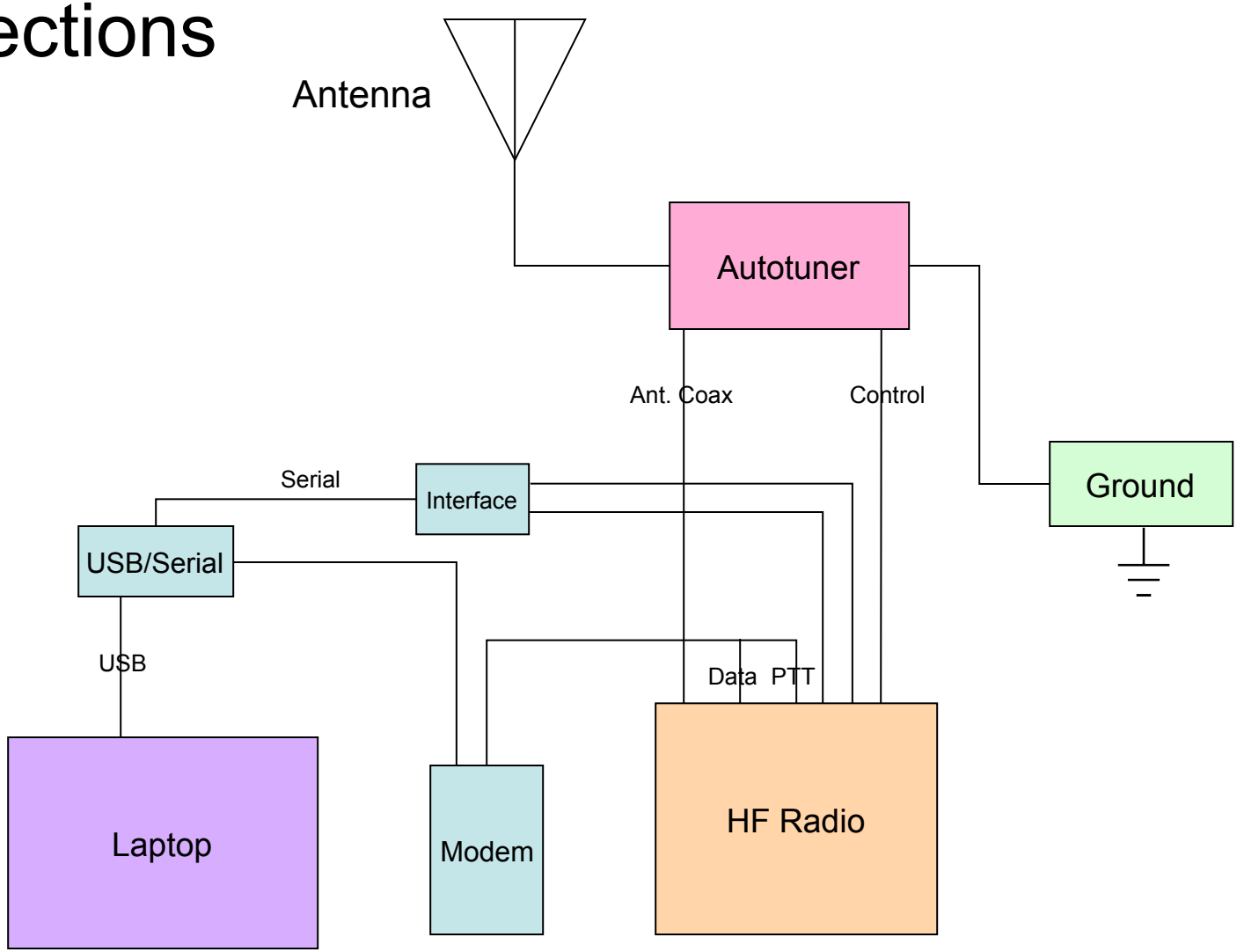
$1,498

$92.50

Pactor: up to 5,512 BPS (10,500 BPS with compression)
or 42 to 79 Kbytes/min

Sound Card: up to 1,875 BPS
or 14 Kbytes/min

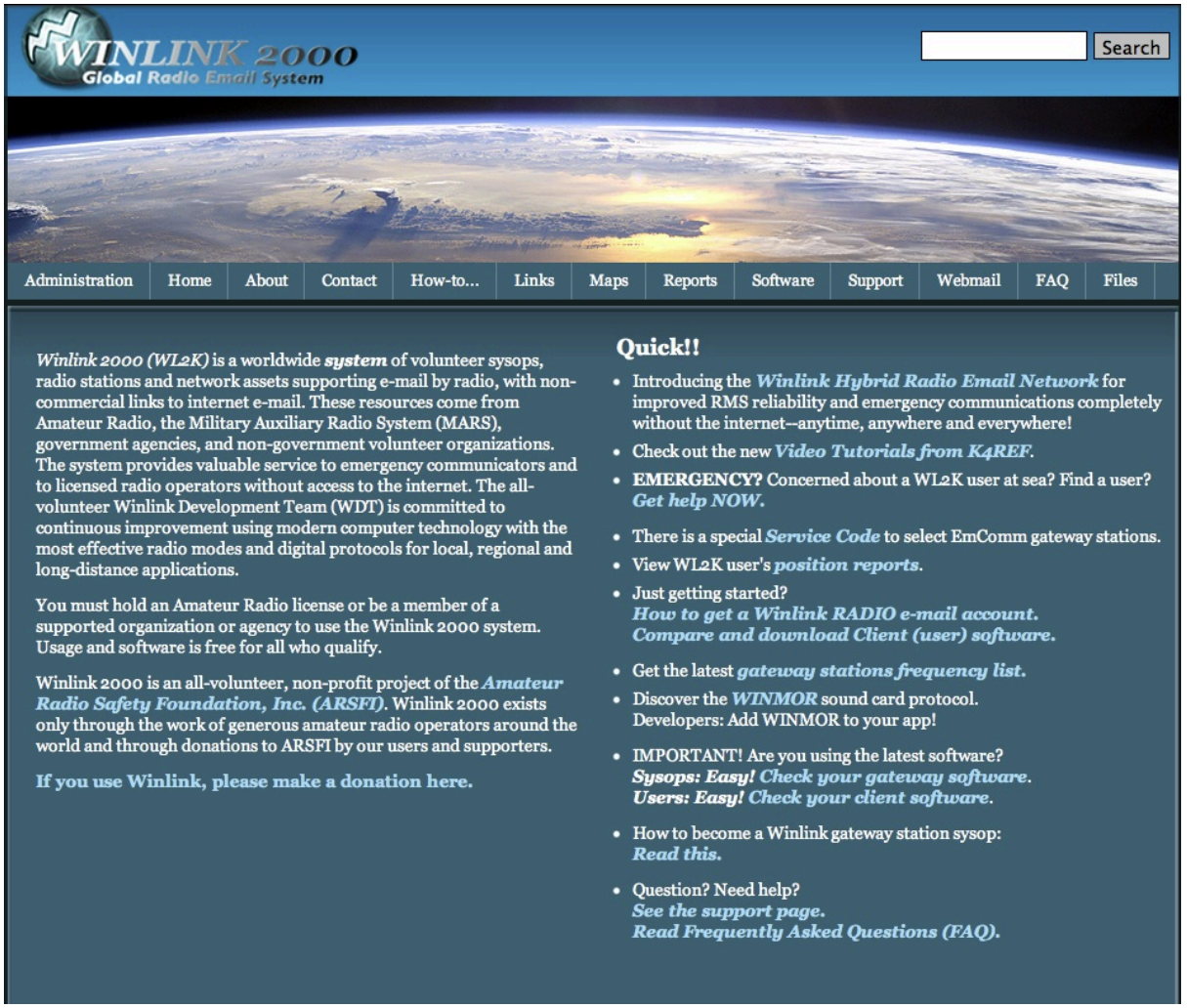
Connections



Services for Email

- There are several providers
  - Winlink, Sailmail, and Cruisemail
- They maintain a shore system of radio stations connected to the Internet
- Winlink has 79 stations and is free
- WINMOR has 74 stations (also free)
- Sailmail has 18 stations and charges $250 per year
- Cruisemail has four stations and costs $250 per year

Services for Email



Winlink web page at http://www.winlink.org/

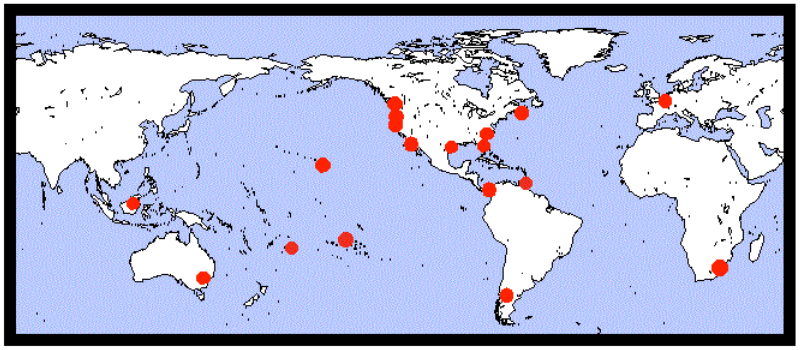
Services for Email

SailMail

SailMail Email Service for Yachts via Iridium, Inmarsat, or SSB

[SailMail Primer] [Downloads] [Terms and Conditions] [WebMail] [Application Form] [Contact Us] [FCC Licenses]

SSB-Pactor Station Locations Worldwide

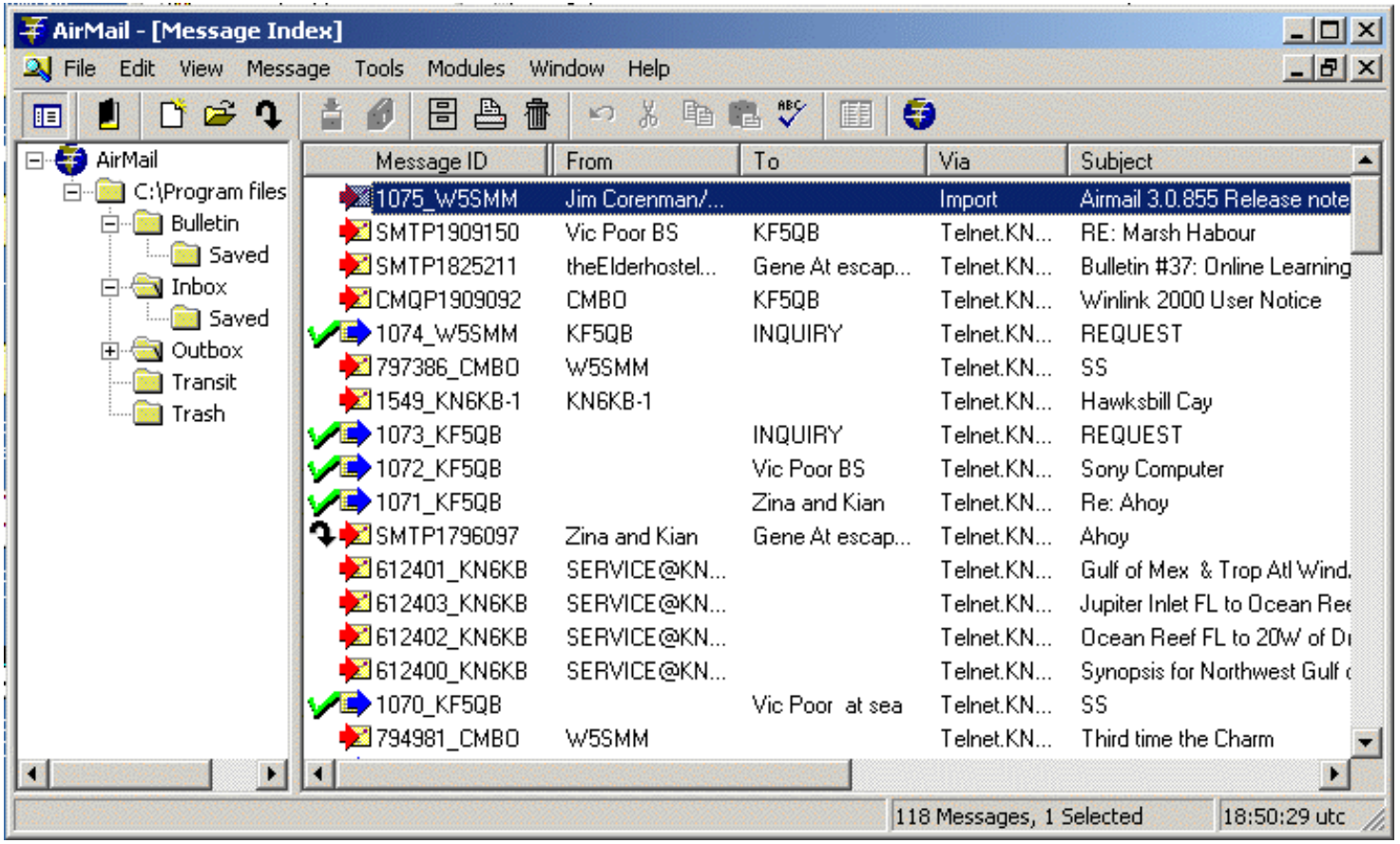


Sailmail web page at http://www.sailmail.com

Software for Email

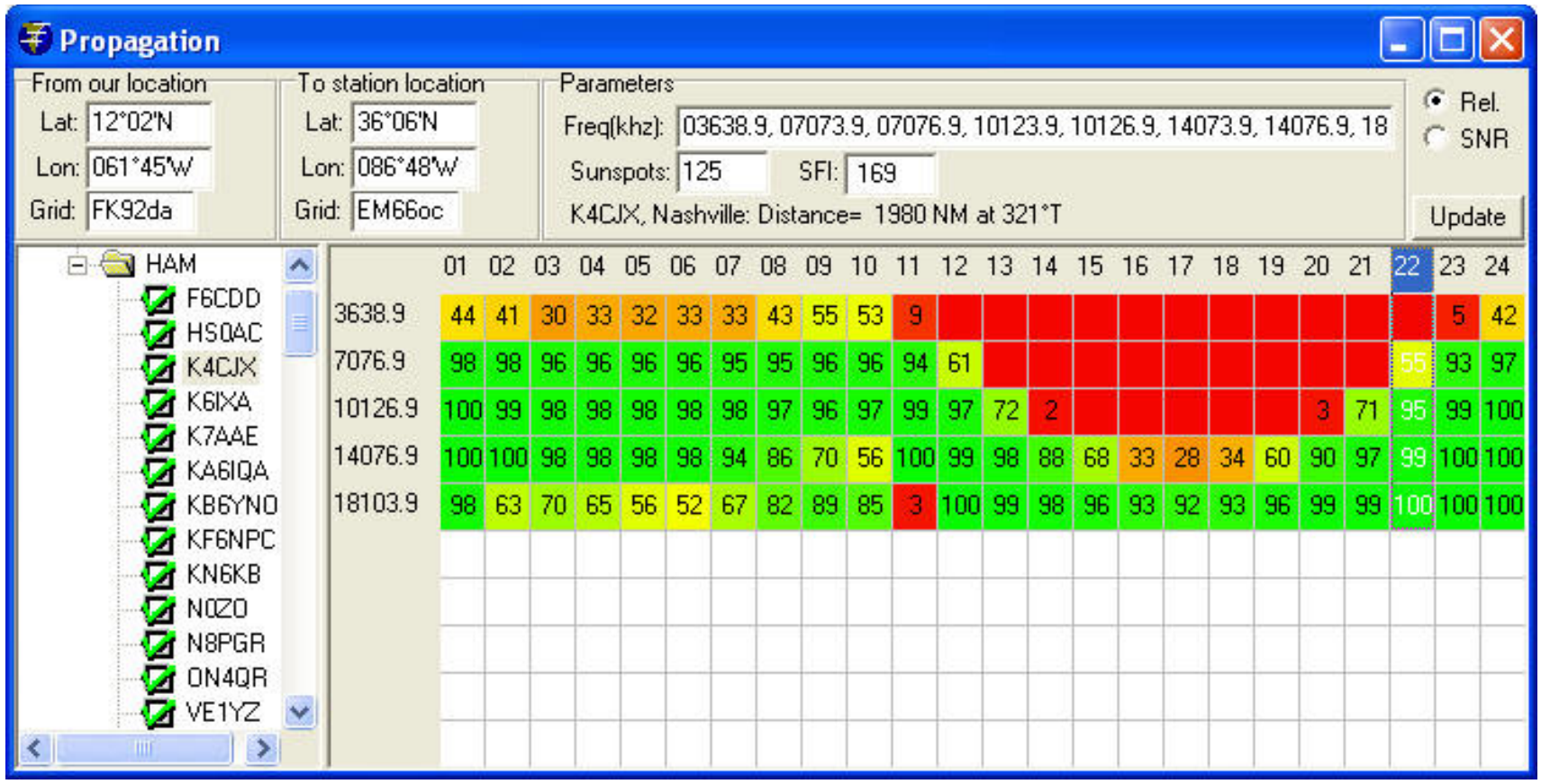
- Airmail
  - Free download
  - Includes windows and commands to control modem (terminal node controller or TNC) and radio
  - Has “standard” email interface
- RMS Express/WINMOR
  - Also a free download from Winlink2000
  - Email client is separate from sound card controller
  - WINlink Message Over Radio (WINMOR)

Airmail



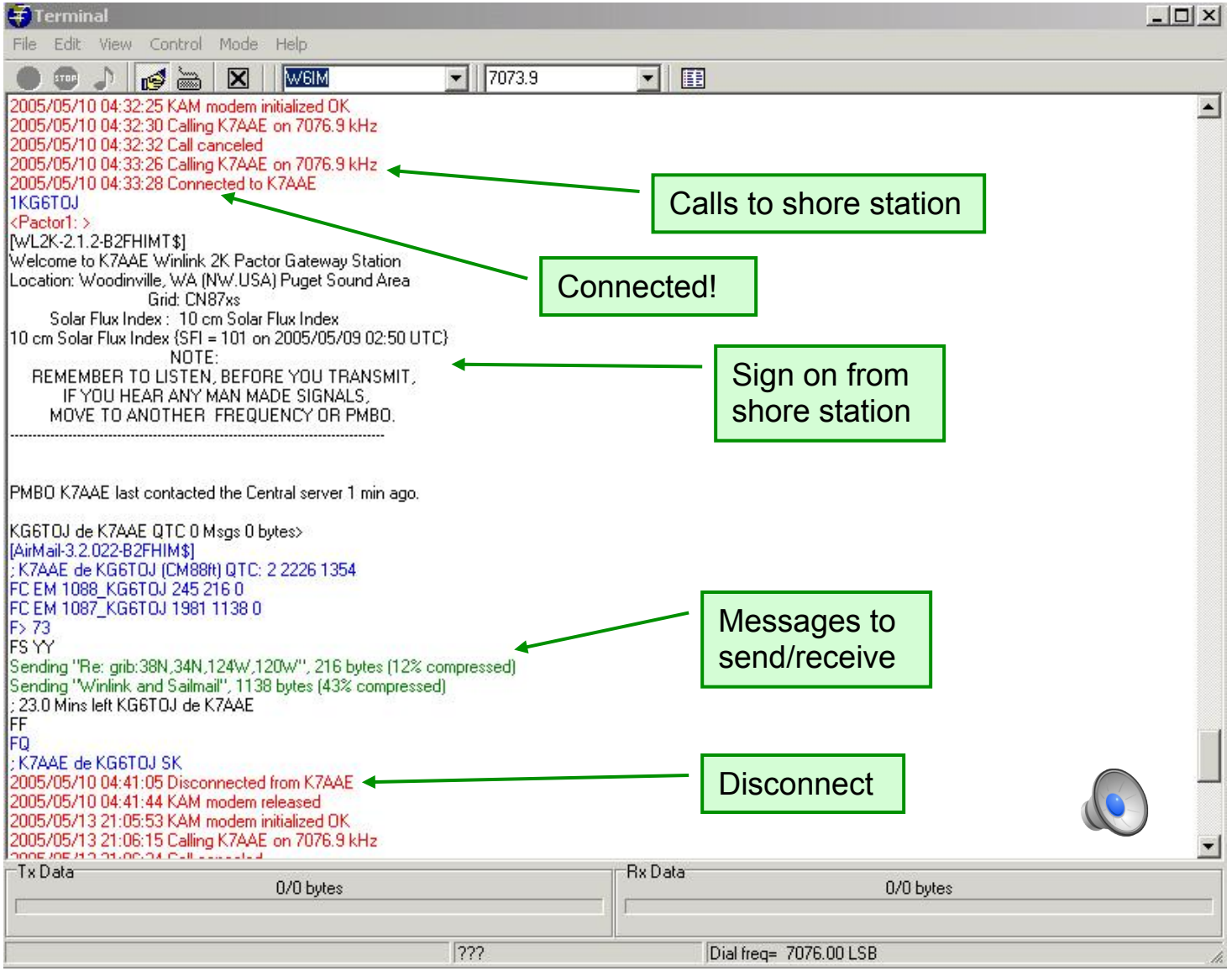
Email window

Airmail



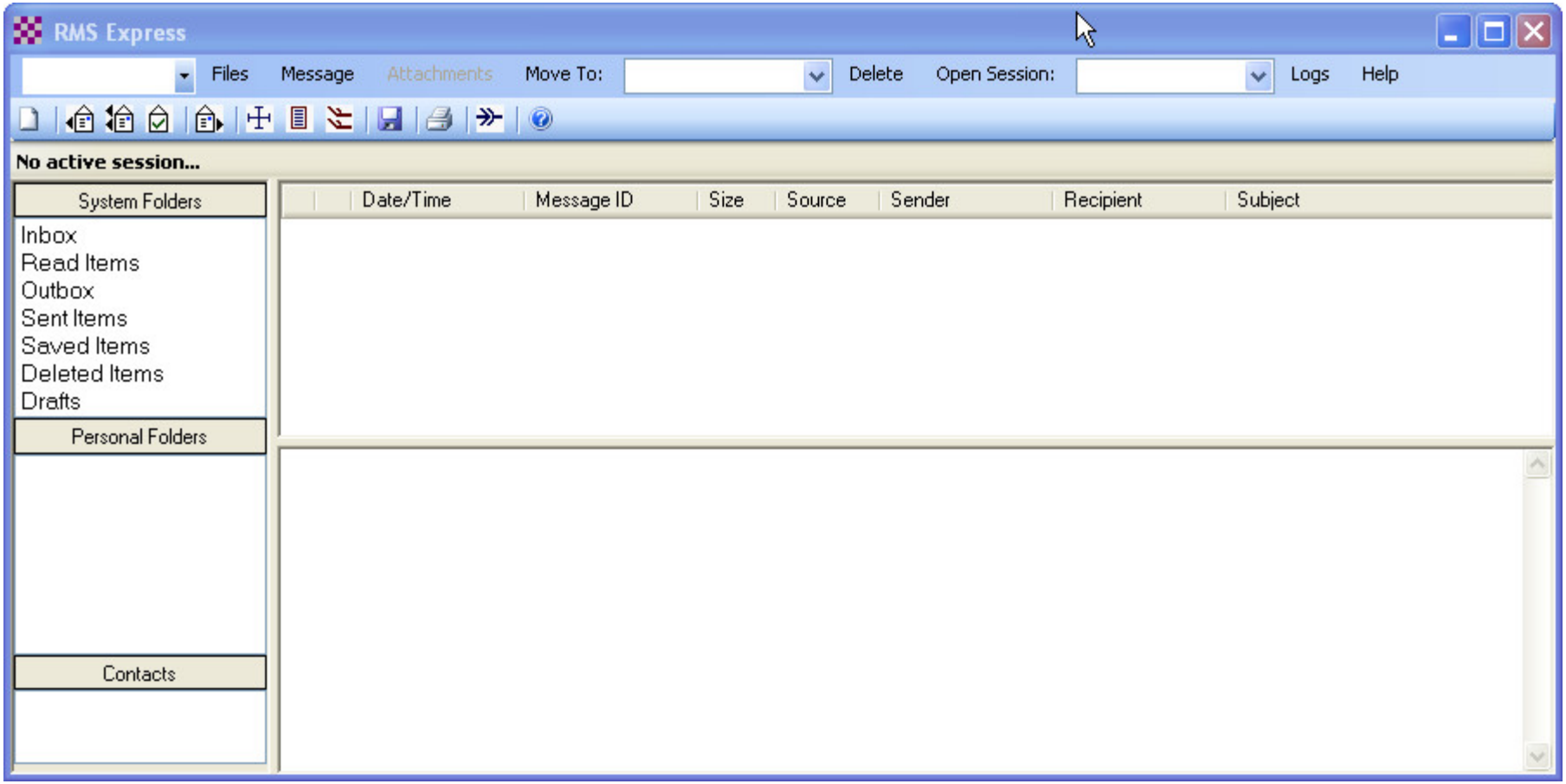
Propagation Window

Airmail



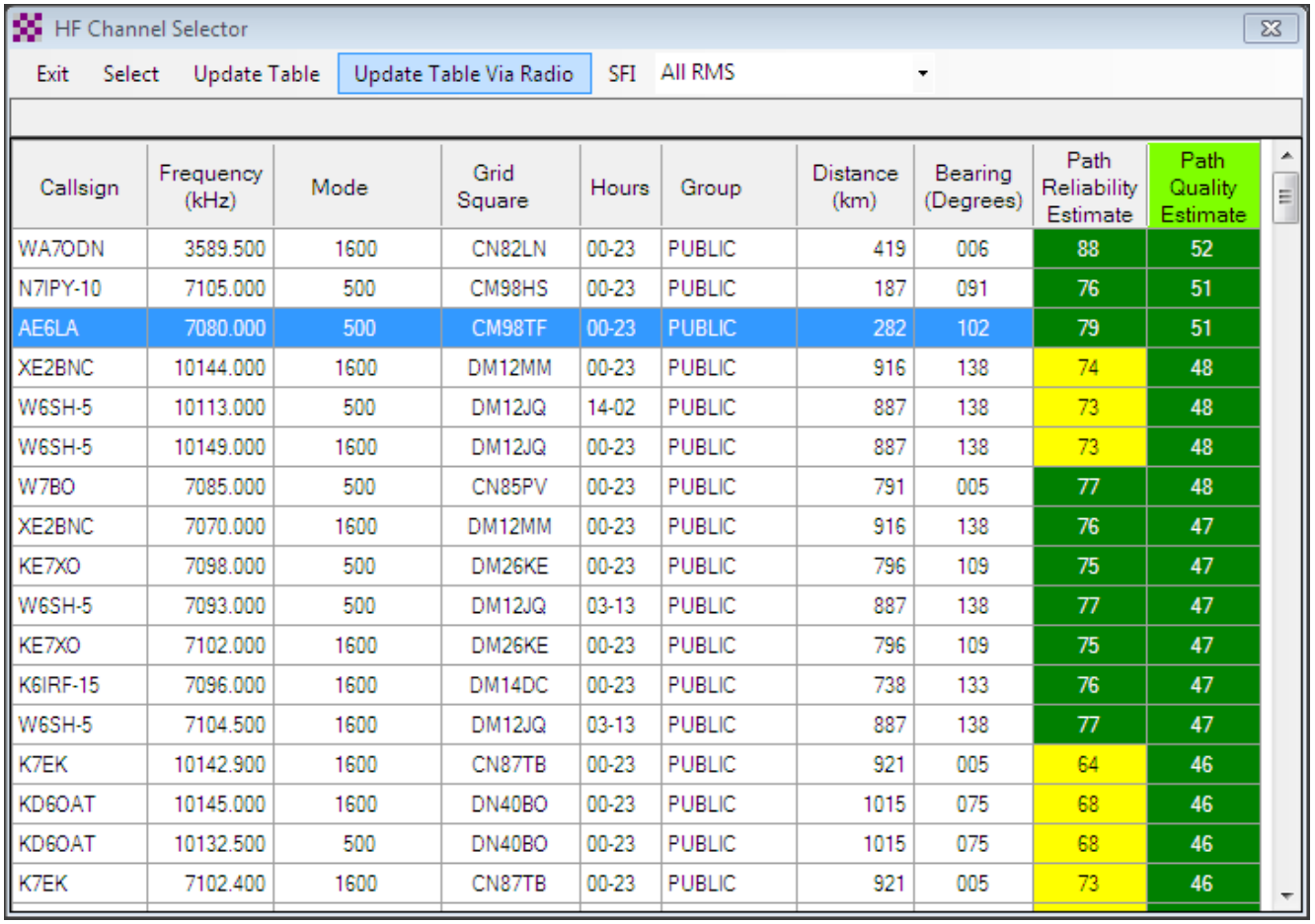
Terminal Window

RMS Express



Email Window

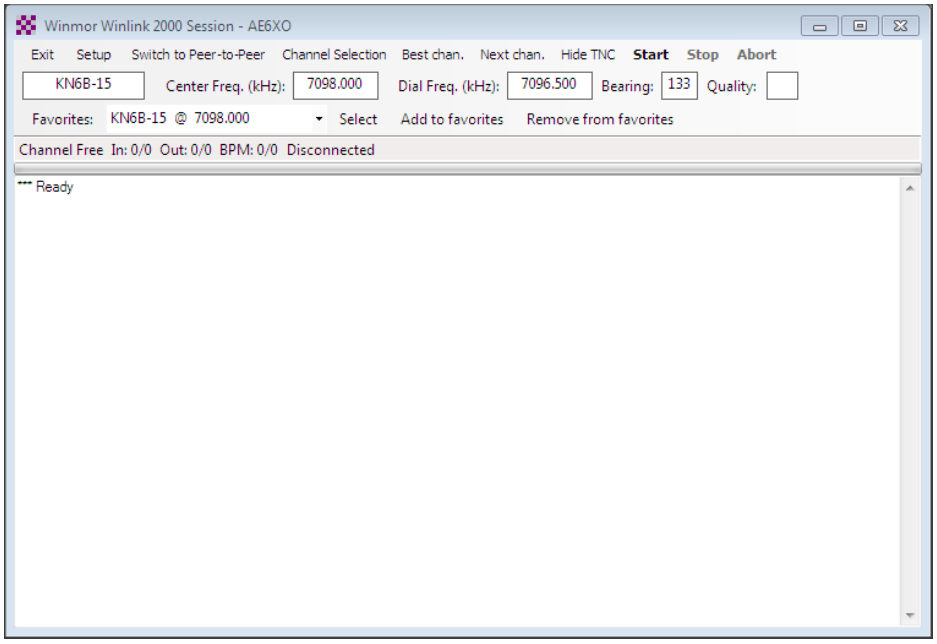
WINMOR

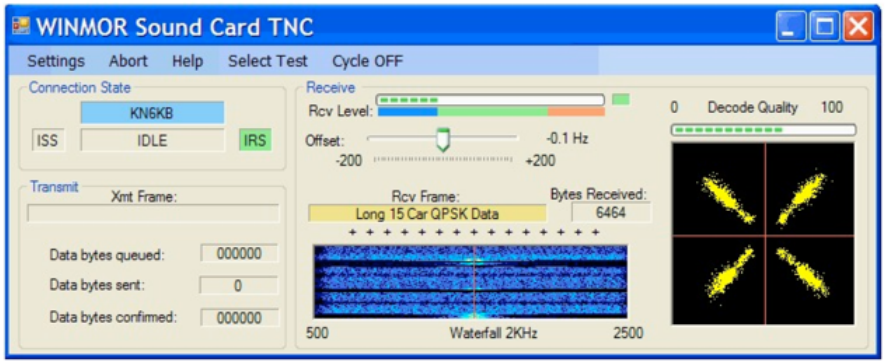


Callsign	Frequency (kHz)	Mode	Grid Square	Hours	Group	Distance (km)	Bearing (Degrees)	Path Reliability Estimate	Path Quality Estimate
WA7ODN	3589.500	1600	CN82LN	00-23	PUBLIC	419	006	88	52
N7IPY-10	7105.000	500	CM98HS	00-23	PUBLIC	187	091	76	51
AE6LA	7080.000	500	CM98TF	00-23	PUBLIC	282	102	79	51
XE2BNC	10144.000	1600	DM12MM	00-23	PUBLIC	916	138	74	48
W6SH-5	10113.000	500	DM12JQ	14-02	PUBLIC	887	138	73	48
W6SH-5	10149.000	1600	DM12JQ	00-23	PUBLIC	887	138	73	48
W7BO	7085.000	500	CN85PV	00-23	PUBLIC	791	005	77	48
XE2BNC	7070.000	1600	DM12MM	00-23	PUBLIC	916	138	76	47
KE7XO	7098.000	500	DM26KE	00-23	PUBLIC	796	109	75	47
W6SH-5	7093.000	500	DM12JQ	03-13	PUBLIC	887	138	77	47
KE7XO	7102.000	1600	DM26KE	00-23	PUBLIC	796	109	75	47
K6IRF-15	7096.000	1600	DM14DC	00-23	PUBLIC	738	133	76	47
W6SH-5	7104.500	1600	DM12JQ	03-13	PUBLIC	887	138	77	47
K7EK	10142.900	1600	CN87TB	00-23	PUBLIC	921	005	64	46
KD6OAT	10145.000	1600	DN40BO	00-23	PUBLIC	1015	075	68	46
KD6OAT	10132.500	500	DN40BO	00-23	PUBLIC	1015	075	68	46
K7EK	7102.400	1600	CN87TB	00-23	PUBLIC	921	005	73	46

Station Selector Window

WINMOR





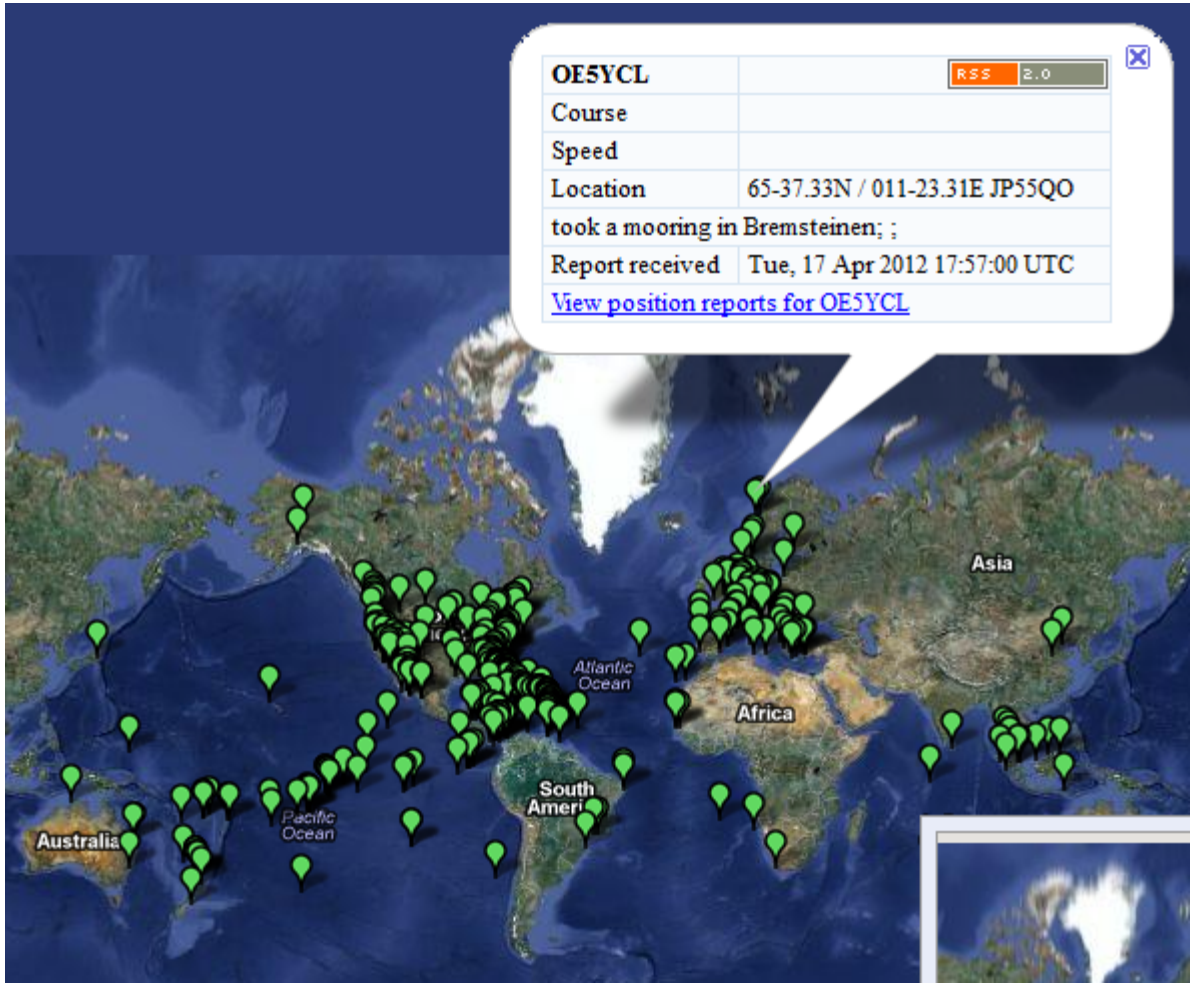
Terminal Windows

Marine HF Nets

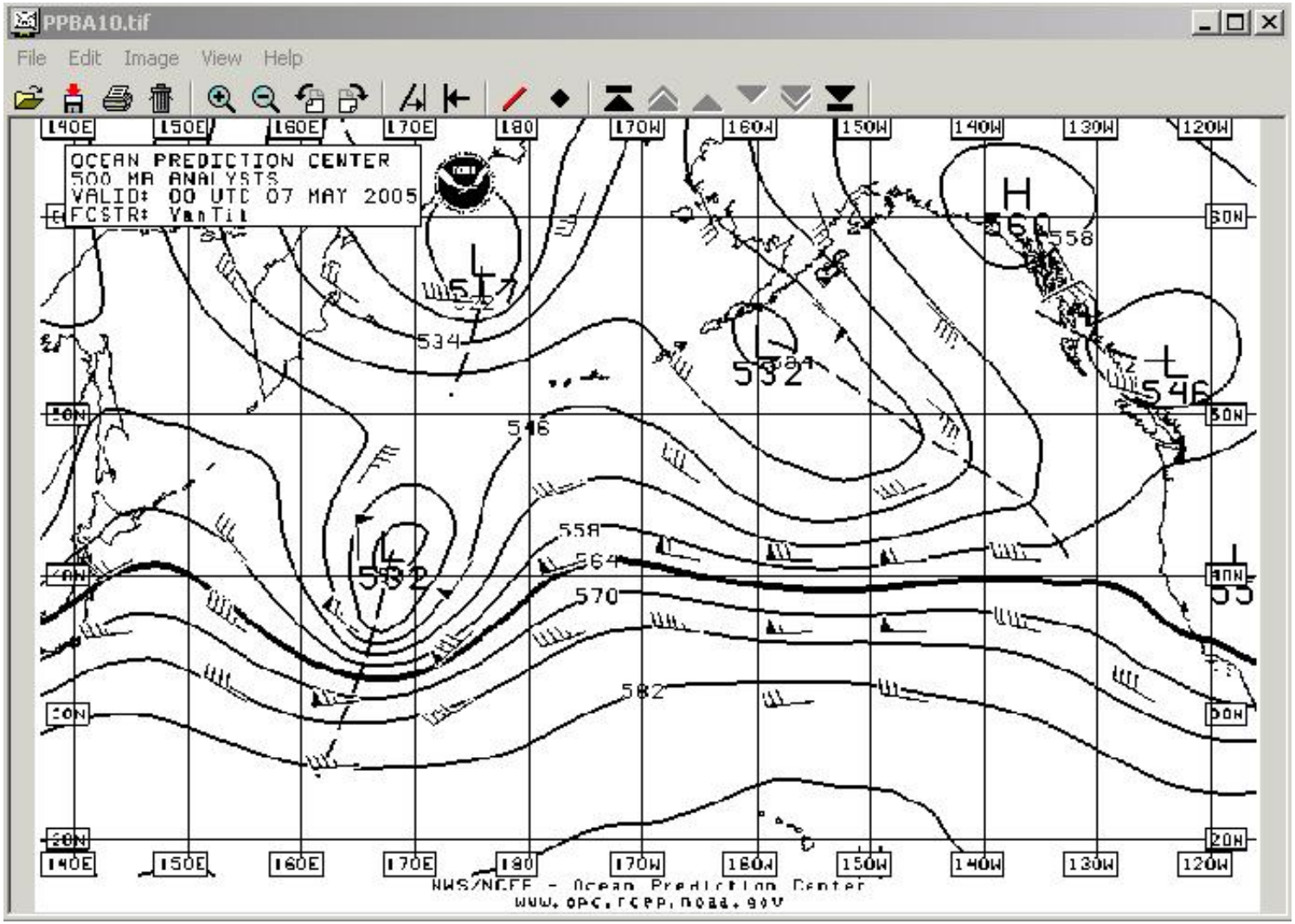
Time/UTC	Freq/kHz	Net Name & Comments	Ham/SSB
1330Z Daily	3.968	Sonrisa Net	Ham
1530Z Daily ST 1530Z Daily DT	7192 LSB	Chubasco Net Monitors for emergency traffic.	Ham
1600Z Mon-Fri	7233.5 LSB	Baja California Maritime Service Net Forecasts San Diego to Puerto Vallarta, including Sea of Cortez. Weekdays only. Provides backup for AA6TP.	Ham
0100Z Daily	6516 USB	Southbound Evening Net	SSB
0200Z Daily	6516	Bluewater Net	SSB
0230Z Daily	4051 - 4060	North Sea of Cortez Net	SSB
0430Z Daily	4030 - 4024	Papagayo Net	SSB
1400Z Daily	6212 / 6217	Amigo Net	SSB
1600Z Daily	8104	Westbound Net	SSB

Marine nets allow sailors to communicate with shore operators and each other and get weather forecasts and other assistance

Position Reports via HF

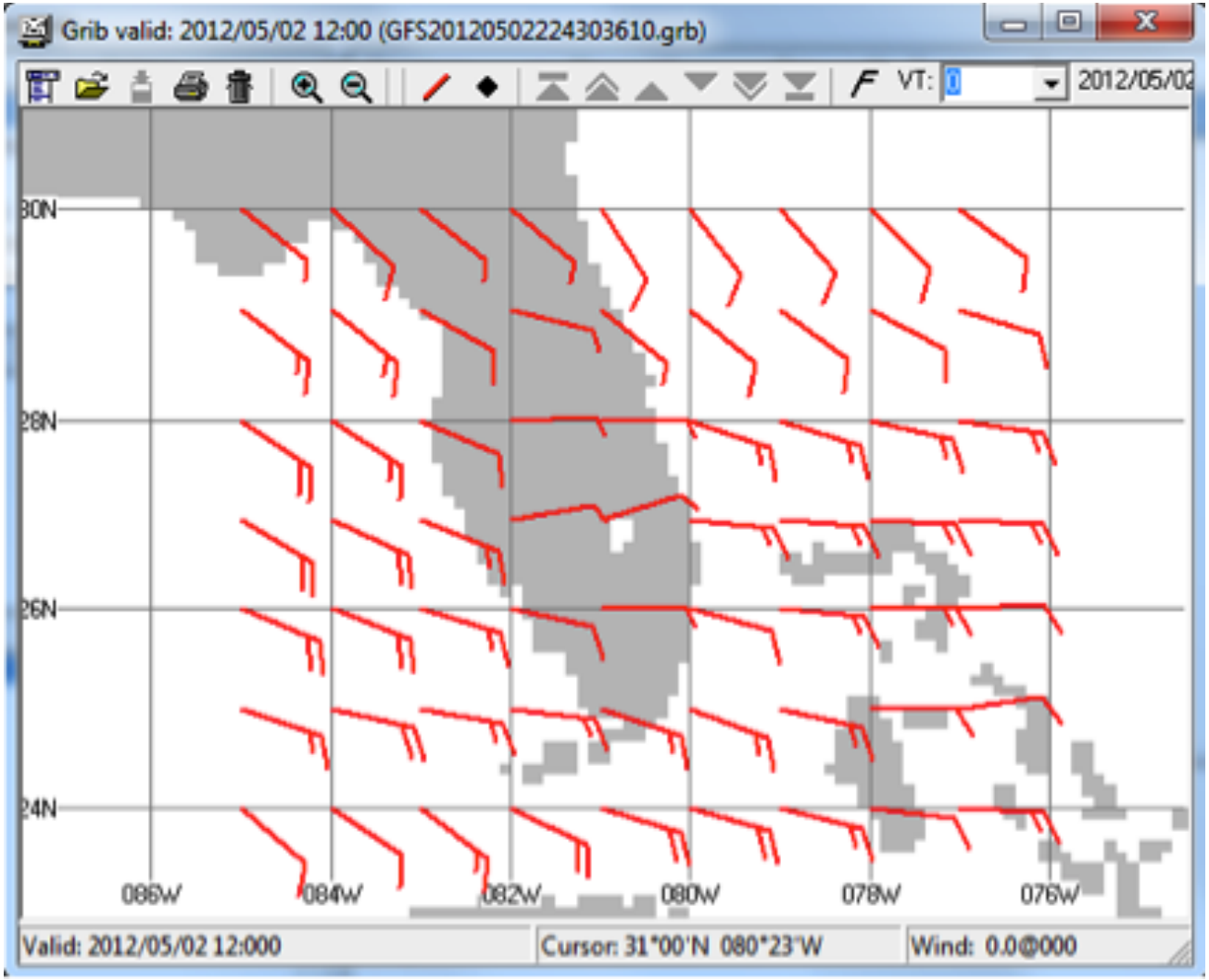


Weather Data



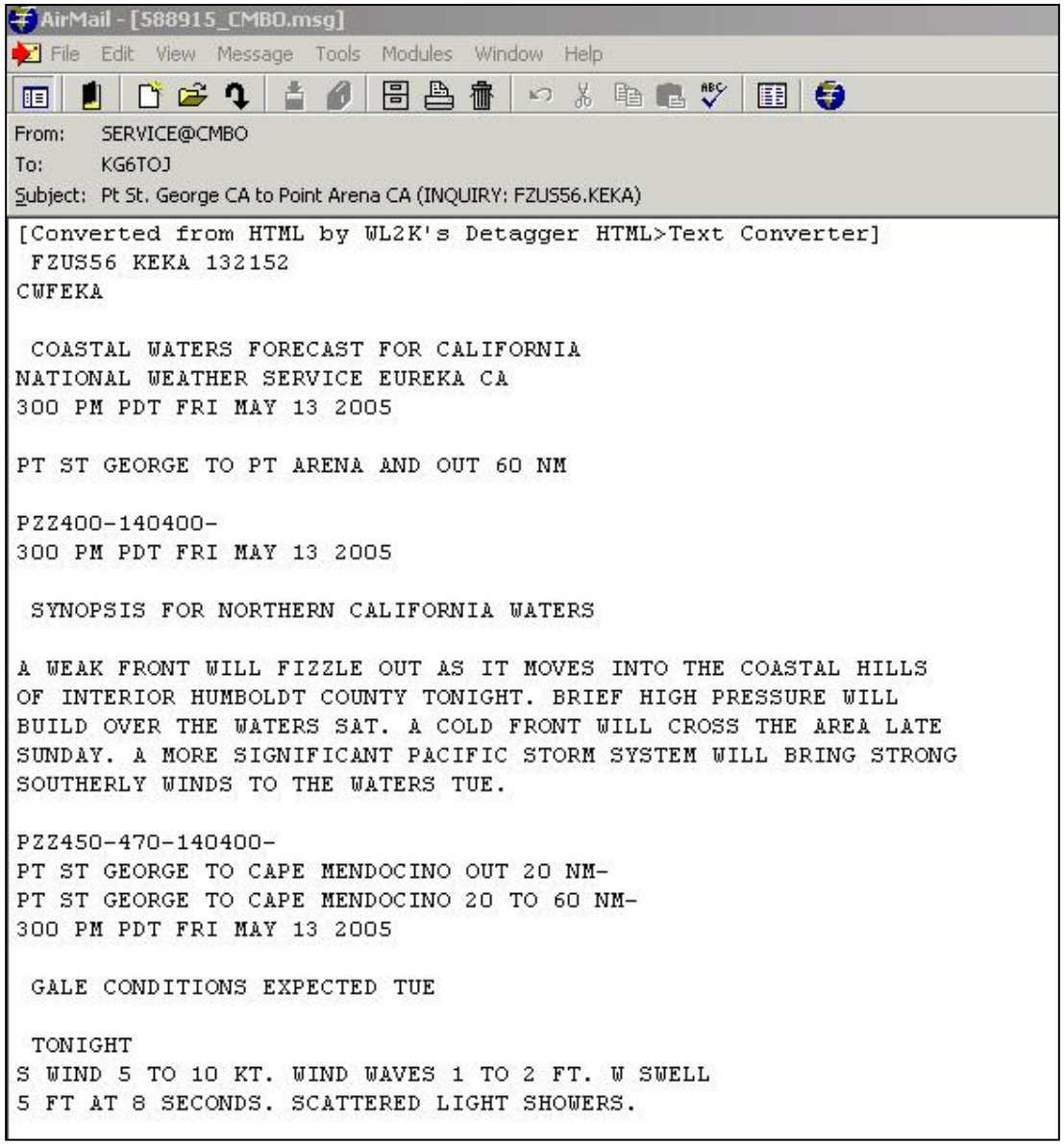
Weather map downloaded using Winlink

Weather Data



Winds downloaded from Winlink (GRIB file)

Local Weather Forecasts



Steps to Installing HF Radio

- Decide if you want to take the amateur test or get the marine license
  - The ham license opens up more options
  - You can have both
- Do research on the type of radio you want
  - Ham vs. marine radio
  - Check that radio has the necessary connections
- Do research on the best antenna and ground system for your boat
  - Internet resources
  - Local professional installers are available

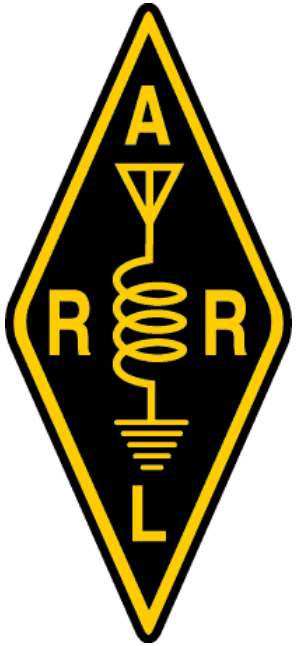
Steps to Installing HF Radio

- Buy the gear and install it
  - Radio system, TNC, laptop, and software
- Get used to the radio system before you leave
  - Tune into nets even while at the dock
  - Check on weather forecasts, etc.
  - Try connecting with HF email providers
  - Less interference offshore

JACK BINNS
Photographed in 1908 in his uniform of an English Marconi ship operator

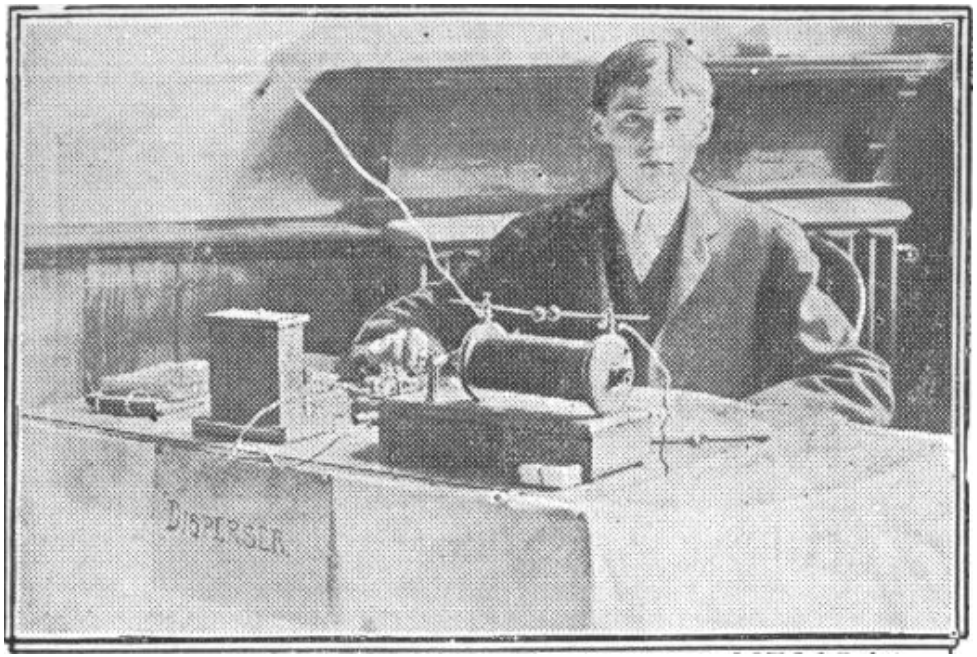
Resources

- Ames Amateur Radio Club (AARC)
  - http://hamradio.arc.nasa.gov
  - Monthly meetings
- American Radio Relay League (ARRL)
  - http://www.arrl.org/
- Federal Communications Commission
  - http://wireless.fcc.gov/marine
- Local amateur radio clubs and yacht clubs
- Local yacht electronics companies



Summary

- Marine HF is an important safety, information, and communications asset for cruising
- It connects you with a community of others with similar interests
- And it may introduce you to a great hobby (ham radio)!

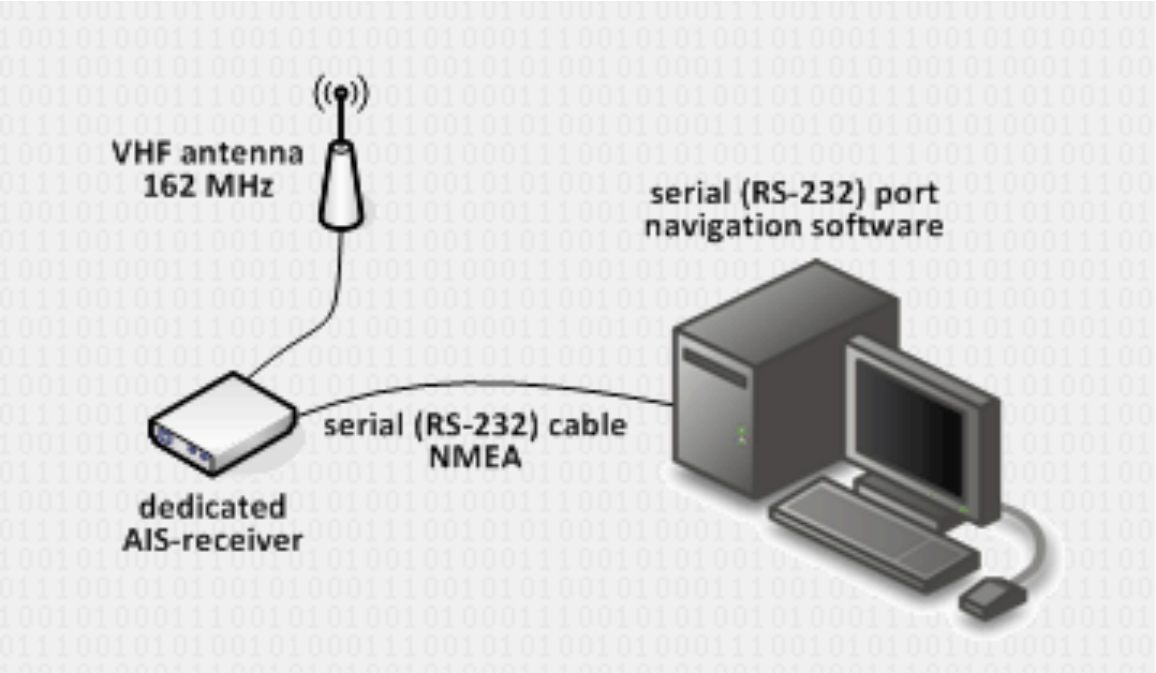


Bonus Slides!

Automatic Identification System (AIS)

- Transmit/receive location of ships and yachts
- AIS must be fitted aboard international voyaging ships of 300 tons or more, and all passenger ships regardless of size
- Optional for pleasure craft
- Uses VHF frequencies (~160 MHz)
- Two types of transceiver
  - Class A must have an integrated display, transmit at 12.5 Watts, and interface with multiple ship systems
  - Class B transmits at 2 Watts and are not required to have an integrated display
- Receiver only
  - Less expensive option for pleasure craft

AIS Configuration



Some AIS systems connect to satellites

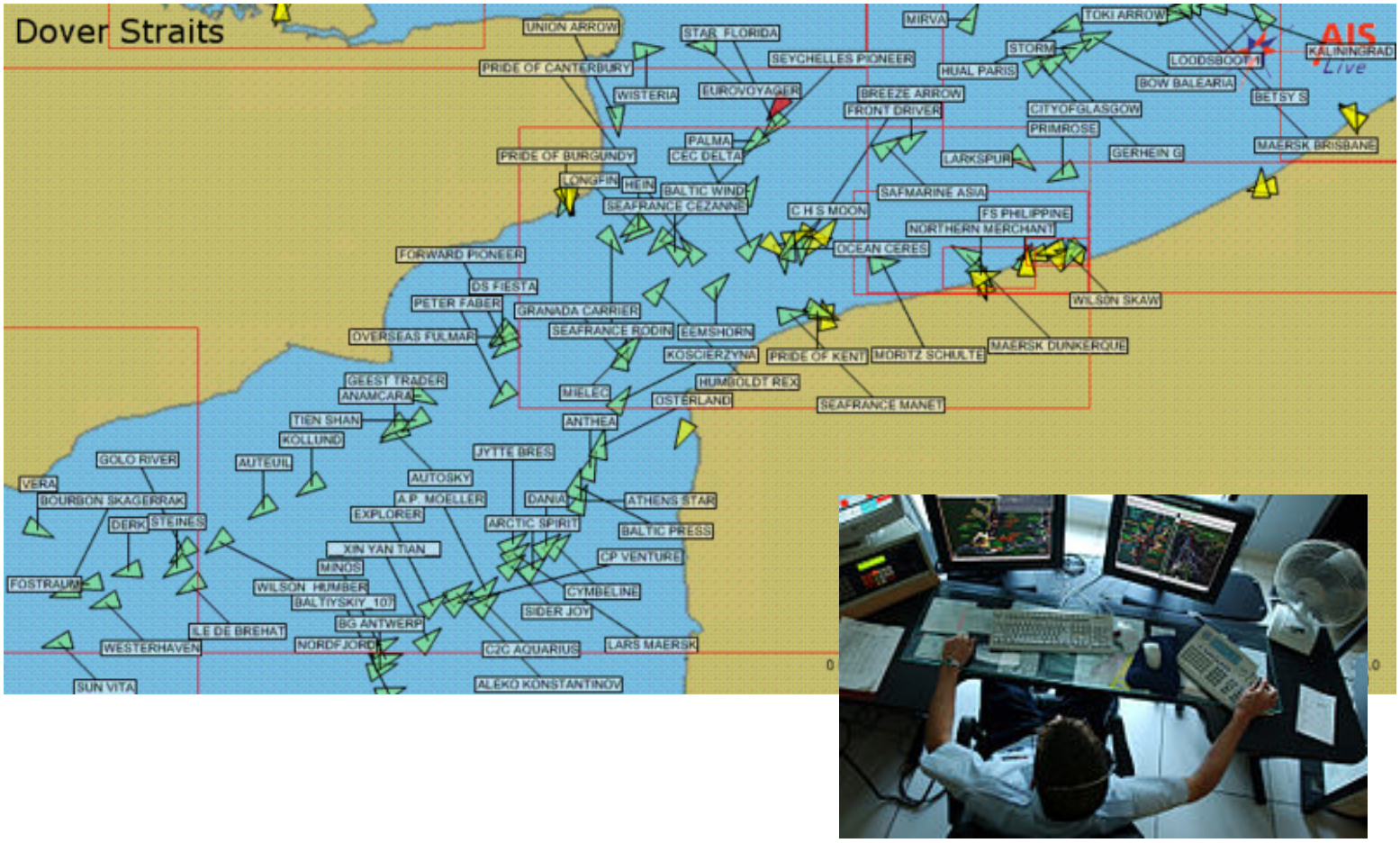
AIS Equipment

Receiver Only

Transponder or
Transceiver

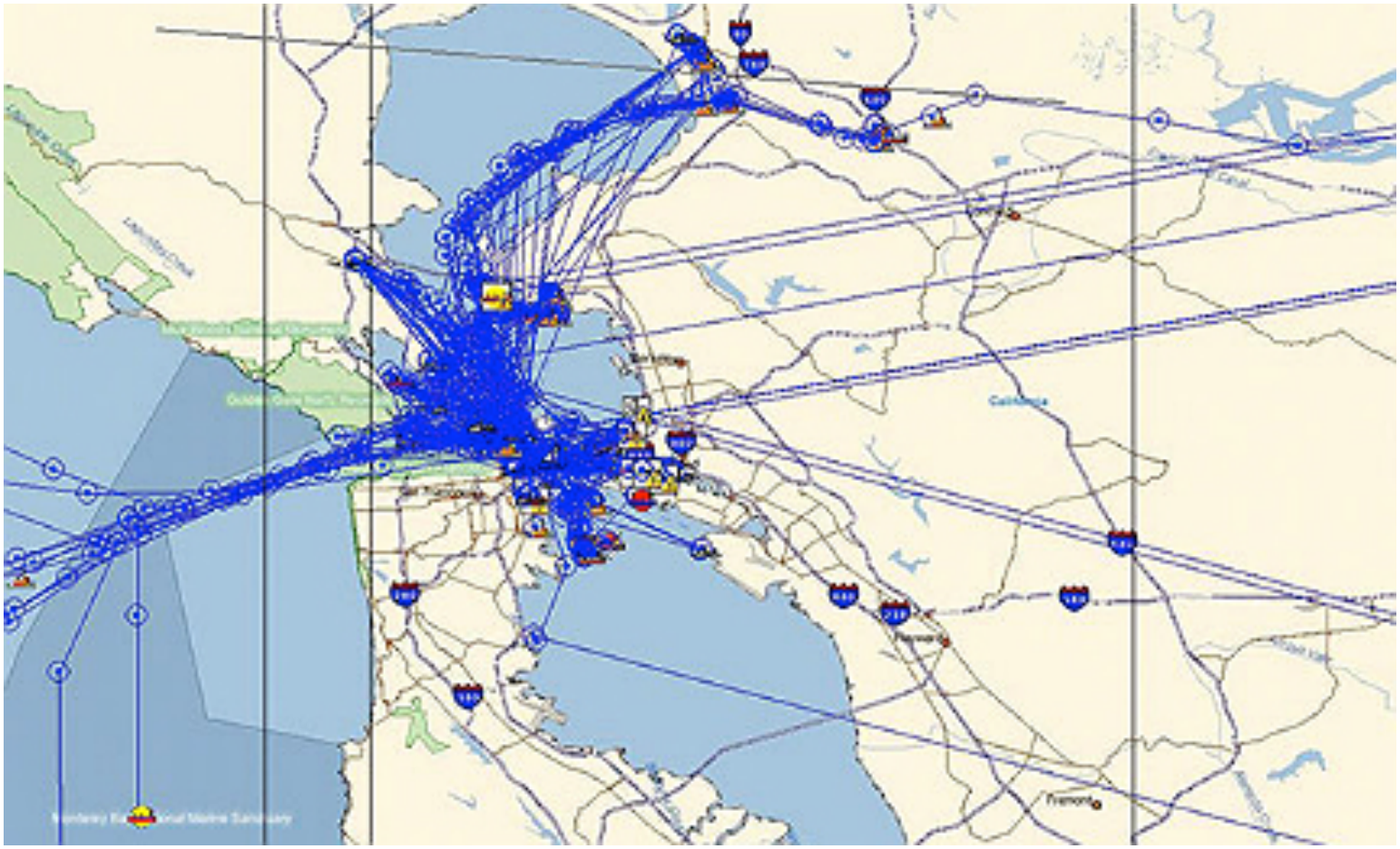
Integrated Display or
Laptop

Vessel Tracking



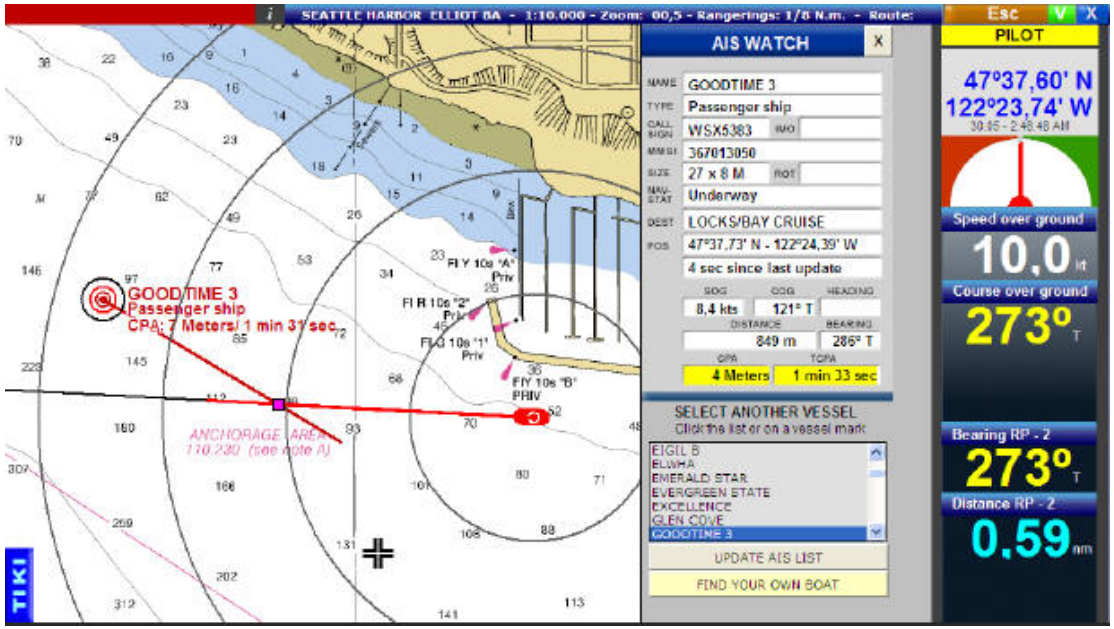
AIS used by USCG Vessel Tracking Service

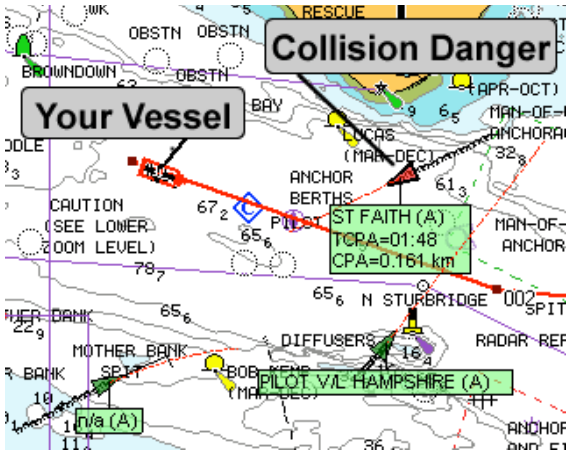
National Automatic Identification System (NAIS)



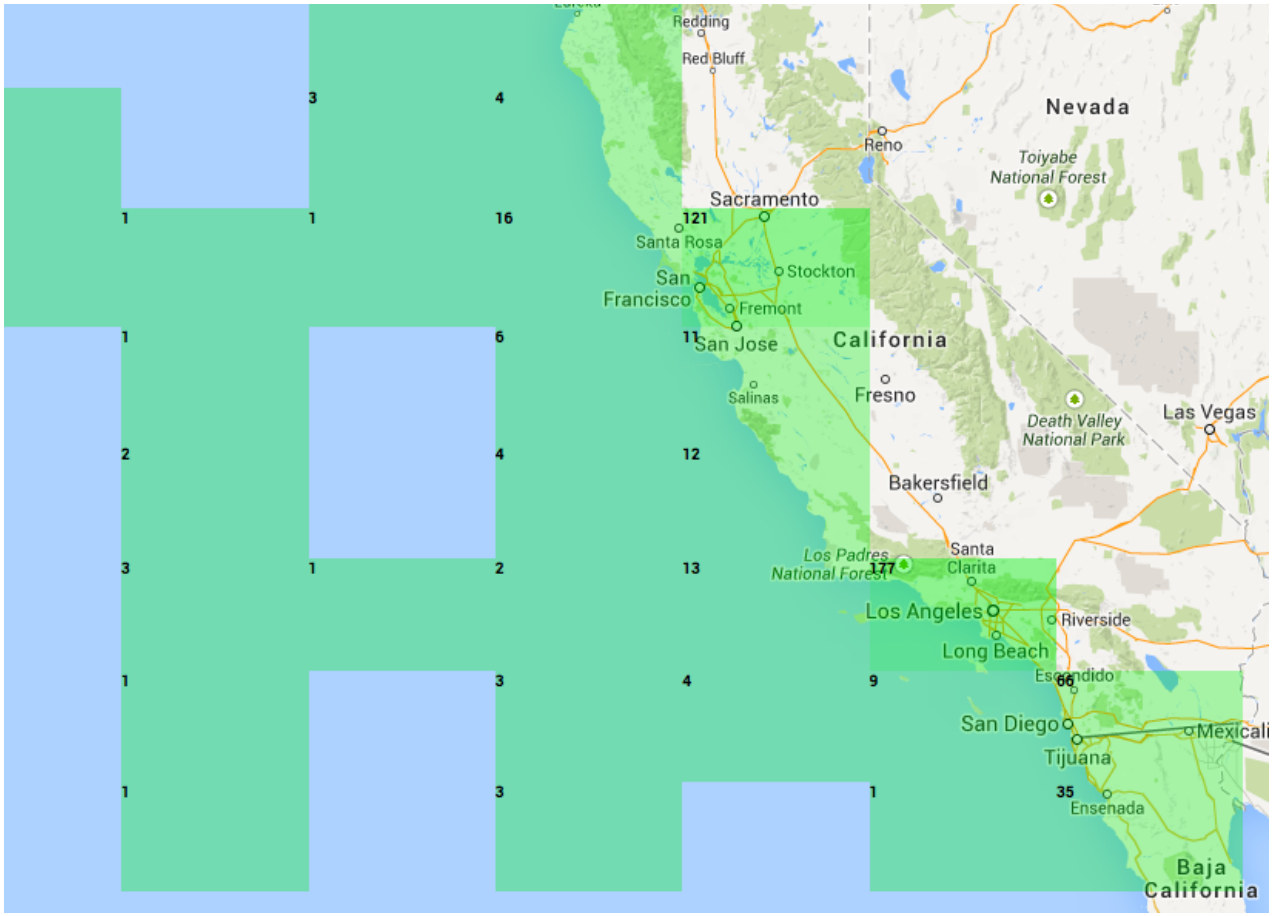
NAIS is run by the USCG. Daily message reception rate is 64 million AIS messages from about 7,900 vessels.

AIS Collision Warning



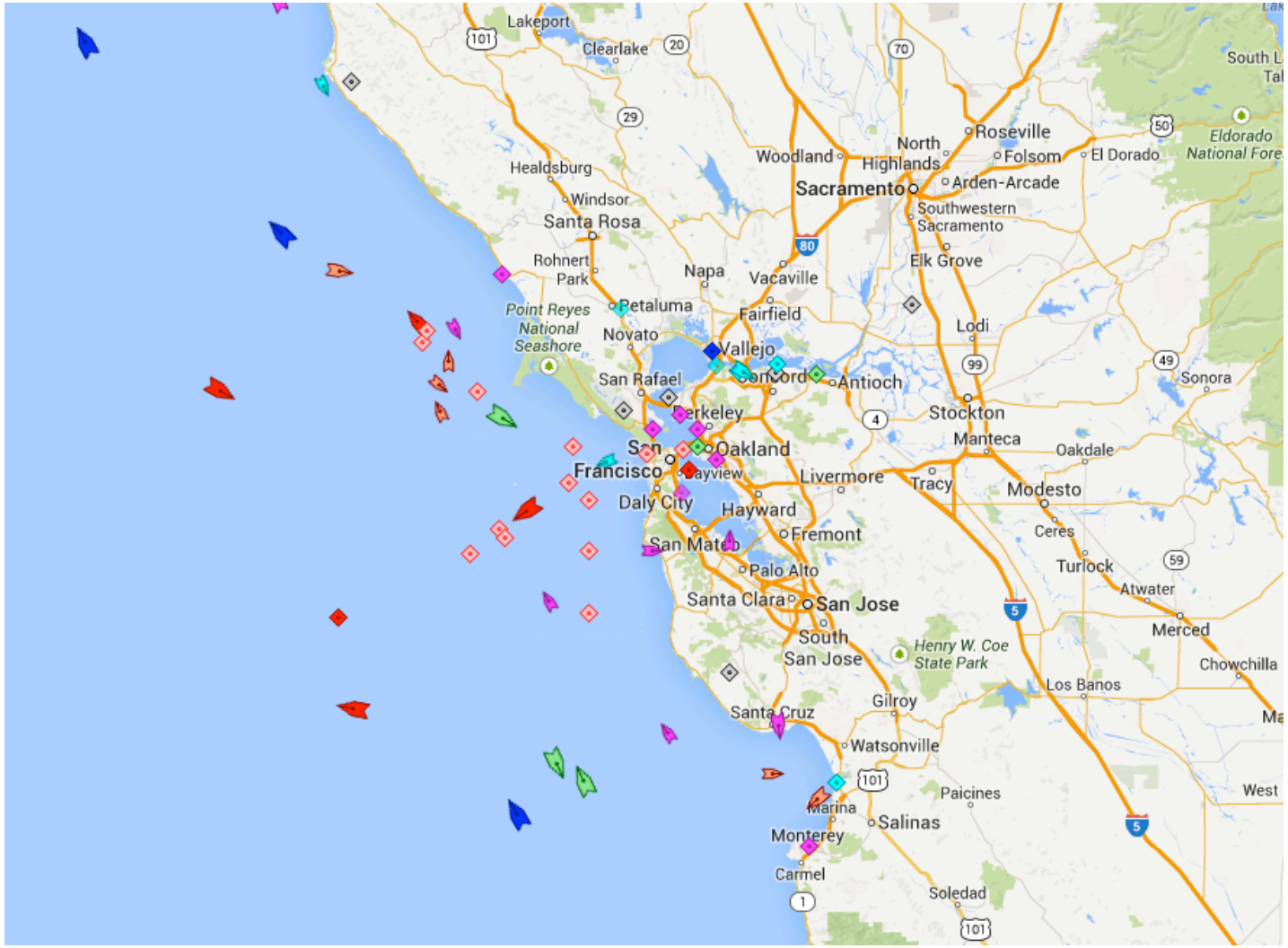


MarineTraffic.com

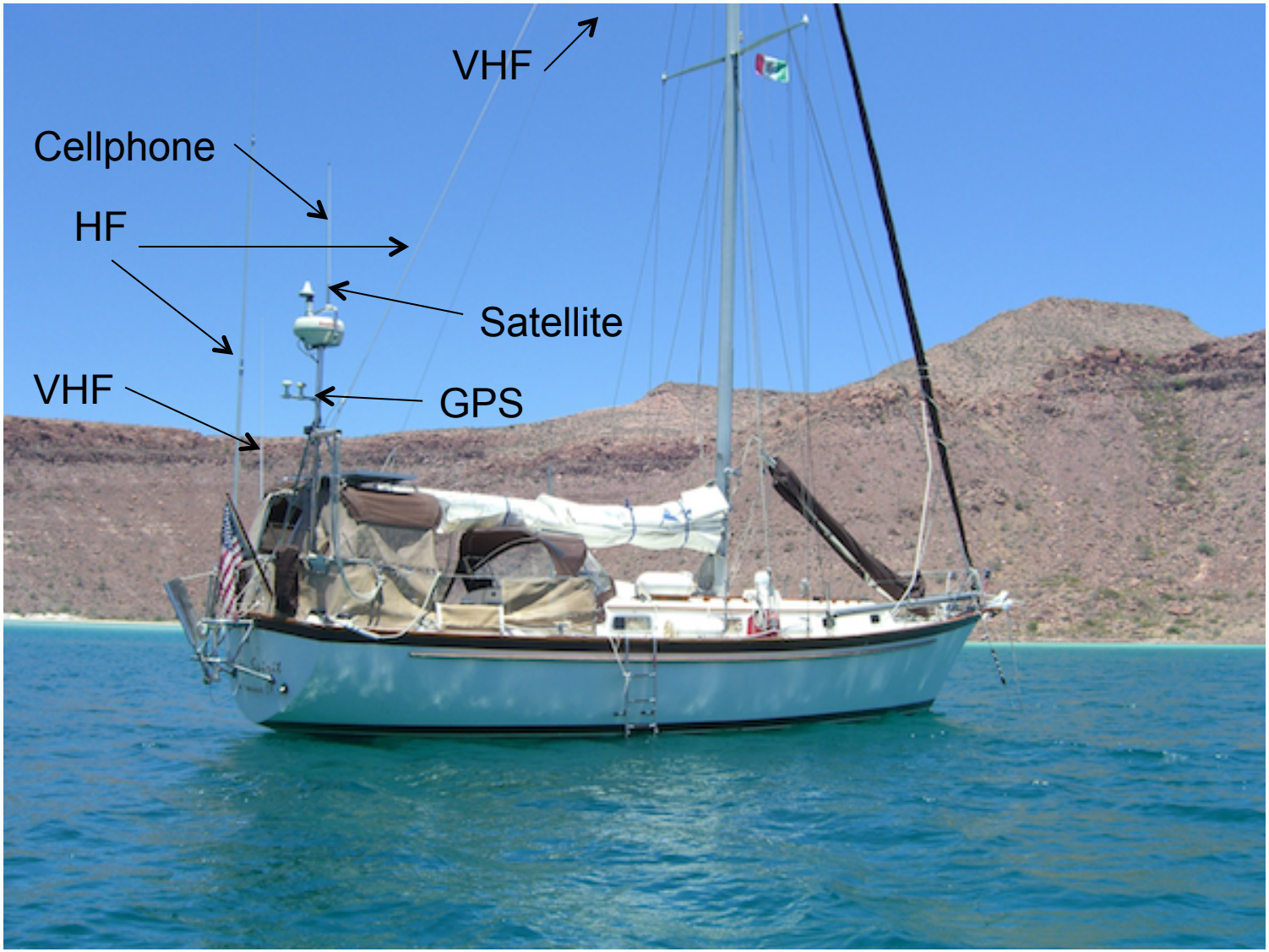


Send data over the Internet to track ships worldwide

MarineTraffic.com



My Boat



Questions?